

bridge near Oak City (site 1, fig. 2) and the State Highway 45 bridge (sites 11 and 12, fig. 2) near the mouth of the river. The approach leading to the development and implementation of the flow model consists of three primary phases: (1) data collection for model implementation and operation; (2) model calibration, validation, and testing; and (3) model application.

Data required to properly calibrate, validate, and operate the model include: (1) continuous records of inflow rates or water-surface elevation at the upstream boundary of the study reach; (2) continuous records of water level at downstream boundaries; (3) cross-sectional geometry (including the flood plain) throughout the study reach; (4) wind speed and direction; and (5) stage records and flow rates at selected locations throughout the study reach to calibrate and validate the model.

Model development consists of calibration, validation, and sensitivity testing. Model calibration is accomplished by adjusting model parameters until model results agree with observations of water levels and flows (Ditmars and others, 1987). The model is considered to be validated if model results agree with observations distinct from those used for model calibration without further adjustment of model parameters (Ditmars and others, 1987). A sensitivity analysis is an integral part of any comprehensive modeling effort. The sensitivity of model results to small changes in boundary conditions (water level, wind, local inflow), computational time interval, model geometry, resistance coefficient, and numerical parameters is being evaluated.

The model is being implemented in phases. A model for the reach between the State Highway 11-42 bridge (river mile 67.0) and Williamston (river mile 36.6) has been calibrated and validated. This model has been extended downstream to Jamesville (river mile 19.4), and preliminary results are available, although verification and testing of this part of the model is not yet complete. Upon completion, the model will include the reach from the State Highway 11-42 bridge to the State Highway 45 bridge (river mile 3).

### Data-Collection

Data collection in the lower Roanoke River and Cashie River study reach consists of (1) continuous measurements of water level, (2) discrete measurements of discharge, and (3) measurements of channel geometry and flood-plain topography.

Pertinent information about the water-level recorders in the study reach is summarized in table 2, and recorder locations in the study reach are shown in figure 2. Upstream from the State Highway 11-42 bridge, the water level is recorded at Scotland Neck and at Roanoke Rapids. Discharge is computed using a stage-discharge relation for the Roanoke Rapids site. Data from these stations are also used in this report. All water levels are referenced to sea level.

Forty-seven discharge measurements were made in the study reach. Those measurements are summarized in table 3.